Antibacterial effects of *Artemisa aucheri* leaf and Spirulina Blue-Green algae aqueous and alcoholic extracts on the multidrug-resistant *Klebsiella pneumoniae* isolated from the patients with pneumonia

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ABSRTRACT

Background and Aim: Antibacterial effects of *Artemisia* plant and algae have been confirmed. The purpose of this study was to evaluate the antibacterial effect of antibiotics, Spirulina blue-green algae and *Artemisa aucheri* leaf extracts on multidrug resistant (MDR) *Klebsiella pneumoniae*.

Materials and Methods: Disk and well diffusion method, the growth minimum inhibitory and bactericidal concentrations (MIC and MBC) were used to evaluate antibacterial effects. Using SPPS 16 soaftware, data were analyzed by analysis of variance (ANOVA) with repeated measures and Bonferroni test ($p \leq 0.001$).

Results: The MIC and MBC for amikacin, colicitin, ceftazidime were 4 and for gentamicin and nalidixic acid were 2 and 1 µg/µl, respectively. In disk and well diffusion methods, the highest growth inhibition zones belonged to ethanolic extracts (0.25 mg/ml) of *Artemisia* and algae. The best MIC and MBC for growth were related to ethanolic extracts of *A. aucheri* at the concentration of 0.15 mg/ml. The diameter of growth inhibition zone around the bacterium was directly related to the concentrations of *Artemisia* and Algae extracts ($p = 0.000$).

Conclusion: Considering the beneficial antibacterial effects of Spirulina blue-green algae and *A. aucheri* which were confirmed in this study, extraction of the active ingredients of medicinal plants is recommended for the mass production of herbal medicines.

Keywords: Antibacterial effect, Extracts, *Artemisa aucheri*, Spirulina blue-green algae, *Klebsiella pneumoniae*